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Study on the Relationship between Tactical Layout and Scoring Efficiency in Volleyball Competition

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Abstract: Volleyball matches are a comprehensive competition of skills and tactics, and tactical layout affects scores and results. Modern volleyball emphasizes fast breaks, strict defense, and targeted serving. This study analyzed the 2018-2019 women's volleyball league and found significant differences in strength, with opponent strength affecting key scoring rates. There was no significant difference in home and away games, and the winning team had an advantage in key indicators, providing a basis for tactical development.

1. Introduction

Volleyball matches involve complex competition, and tactical layout is closely related to scoring efficiency. In high-level competitions, both decision-making and execution are crucial[1]. The Chinese Women's Volleyball Super League gathers strong teams, and studying the relationship between tactics and scoring can help teams optimize tactics, improve results, and provide reference for theoretical research and practice[2].

2. Study subjects and methods

2.1. Study subjects

This study focuses on the technical statistics of the technical and tactical application effects of participating teams in the 2018-2019 Chinese Women's Volleyball Super League, covering multiple key indicators such as spike and serve. The top women's volleyball teams of the season have excellent competitive skills and diverse tactics. Through analysis, the aim is to reveal the characteristics and effects of team usage, providing scientific basis for volleyball training and competition strategy formulation.

2.2. Study Methods

2.2.1. Literature and data method

This paper takes "tactical performance analysis" as the key word, searches more than 40 Chinese and English literatures on the Internet and English literature index websites, and establishes research ideas. Selecting the technical and tactical statistical data of Chinese Women's Volleyball Super League teams from 2018 to 2019 as a sample, including 7 indicators, divided into three groups of variables, to explore the changes in technical and tactical performance indicators under different game situations (Table 1).

Table 1 Group grouping of competition technical and tactical indicators

Variable group	metric
Active score-related variables	Dunk scoring rate, serve scoring rate, block scoring rate
Related variables of the offensive support link	Effective defense rate, return rate, effective pass rate
Passive score-related variables	The opponent mistakes

2.2.2. Mathematical and Statistical Methods

All match data are processed in Excel and imported into SPSS20.0. Teams 1-8 are upstream, 9-14 downstream by league ranking. Independent sample t-tests analyze mean differences of technical-tactical indicators (independent variables: team/opponent strength, venue, result). P<0.05/0.01 indicates significant/extremely significant differences; opponent errors use counts, others percentages.

3. Results and analysis

3.1. Influence of the participating teams 'own strength on the team's technical and tactical performance indicators

3.1.1. Comparative analysis of the application effect of the techniques and tactics of the upstream and downstream participating teams

Taking the strength of the participating teams as the independent variable, teams ranked 1-8 are considered upstream teams, and teams ranked 9-14 are considered downstream teams. Organize the technical statistical indicators of 194 matches for the upstream team and 108 matches for the downstream team, as shown in Table 2.

Table 2 Comparison of the technical and tactical indicators of the upstream and downstream participating teams

Team strength / Technical and tactical indicators	Top 8 upstream teams (N=194) The mean ±standard deviation	The last six downstream teams (N=108) The mean ±standard deviation	T checkout		
			t	df	Sig
The spike score rate is (%)	46.78±1013	40.39±11.28	.041	300	0.000
The block score rate is (%)	18.62±13.79	12.22±11.41	4.099	300	0000
Service score rate is (%)	8.B±4.98	8.09±4.44	-.098	300	0.922
Defensive reach percentage (%)	53.57±21.87	41.68±20.90	4.599	300	0000

Effective pass rate is (%)	58.82±26.95	46.71±23.49	3.916	300	0.000
Receiving rate of (%)	72.67±20.51	50.08±25.30	8426	300	0.000
Number of opponent errors (N)	17.23±5.03	17.44±697	-.313	300	0.755

The results showed that the upstream team was significantly higher than the downstream team in five aspects, including dunk success rate (P<0.01), while there was no statistically significant difference between the two teams in serving score rate and number of errors [3].

3.1.2. Comparative analysis of the technical and tactical performance of the participating teams of the same level

Divide the top 8 teams in the league into upstream groups (1-4) and downstream groups (5-8), and compare their 32 qualifying matches and 64 group data. Using the team as the independent variable and technical and tactical performance as the dependent variable (Table 3), explore the changes in technical and tactical indicators of teams at the same level.

eam and downstream teams in the same file (Stage 2)

Team strength / Technical and tactical indicators	1-4 upstream teams 5-8 downstream teams		T checkout		
	(N=32) The mean ± standard deviation	(N=32) The mean ± standard deviation	t	d	Sig
attacking average (%)	44.69±6.92	42.94±9.92	0.819	62	0.416
The block score rate is (%)	19.46±14.39	17.34±10.26	0.681	62	0.499
Service score rate is (%)	7.66±2.64	7.37±5.47	0.263	62	0.794
Defensive reach percentage (%)	63.42±21.94	44.16±1869	3.779	62	0.000
Effective pass rate is (%)	0.66±30.24	61.26±2452	-.088	62	0.930
Receiving rate of (%)	78.40±14.04	73.18±14.67	1.455	62	0.151
Number of opponent errors (N)	17.13±5.05	16.69±5.54	0.330	62	0.743

In conclusion, the comparison of technical and tactical indicators shows upstream teams excel in active scoring and offensive support, with no significant differences in serving scores and passive scores.Among the top 8 teams in the same level, the 1-4 teams have a significant advantage in defense rate, while there is no significant difference in other indicators.

3.2. Influence of the opponent's strength on the team's technical and tactical performance indicators

This study selected group stage data, with teams of different strengths as independent variables and technical and tactical performance as dependent variables, divided into upstream (top 8) and downstream teams[3]. The T-test results showed that there were significant differences (P<0.05 or P<0.01) in the spike score rate, serve score rate, and opponent error frequency when facing opponents of different strengths, while there was no significant difference (P>0.05) in the blocking score rate and effective pass rate(Table 4).

Table 4 Technical and tactical indicators against different opponents (group stage)

The strength of the opponent / Technical and tactical indicators	Against the upstream team	Against downstream teams	T checkout		
	(N=95) The mean ± standard deviation	(N=73) The mean ± standard deviation	t	df	Sig
The spike score rate is (%)	40.58±10.48	50.26±11.85	-5.603	166	0.000
The block score rate is (%)	9.55±8.42	21.50±10.88	-1.145	166	0.254

Service score rate is (%)	7.05±3.65	9.60±4.71	-3.968	166	0.000
Defensive reach percentage (%)	44.35±21.40	8.53±20.98	-1.268	166	0.207
Effective pass rate is (%)	51.68±25.29	49.87±22.77	.481	166	0.631
Receiving rate of (%)	63.87±23.25	55.20±25.37	2302	166	0.023
Number of opponent errors (N)	15.49±5.52	18.1l±5.83	-2.969	166	0.003

3.3. The impact of home and away games on the team's technical and tactical performance indicators

Using home/away as independent variables and tactical performance indicators as dependent variables (Table 5).The study found that the tactical indicators of home games were higher than those of away games, but the test (P>0.05) showed no significant difference between the two, and there was no absolute advantage at home. Therefore, in the Chinese Women's Volleyball Super League, there is no significant difference in the technical and tactical indicators between home and away matches[4].

Table 5 Comparison of technical and tactical indicators of different competition locations (home and away games)

The strength of the opponent / Technical and tactical indicators	Home field (N=141) The mean ±standard deviation	Away (N=141) The mean ± standard deviation	T checkout		
			t	df	Sig.
The spike score rate is (%)	44.44±10.26	44.39±11.98	0.031	280	0.976
The block score rate is (%)	17.05±13.87	14.52±12.9	1.623	280	0.106
Service score rate is (%)	7.89±4.27	7.93±4.10	-.084	280	0.933
Defensive reach percentage (%)	51.42±23.30	48.90±21.22	0.951	280	0.343
Effective pass rate is (%)	55.74±26.93	52.95±26.66	0.874	280	0.383
Receiving rate of (%)	65.39±25.71	63.13±24.20	0.760	280	0.448
Number of opponent errors (N)	17.67±5.65	17.1l±5.91	0.804	280	0.422

3.4. The influence of different match results on the team's technical and tactical performance

The match result is treated as a situational variable or goal, with the winning index as the independent variable. Volleyball outcomes are uncertain, divided into 3, 4, or 5 sets, affecting tactical performance. Tactical indicators under three result types are analyzed using outcome as independent variable (Table 6, Table 7, Table 8).

Table 6 Comparison of various technical and tactical indicators of different competition results (3 games)

results / Technical and tactical indicators	Win 3:0 (N=85) The mean ± standard deviation	Negative 0:3 (N=85) The mean ±standard deviation	T checkout		
			t	df	Sig
The spike score rate is (%)	52.83±10.67	37.35±9.15	9.960	162	0.000
The block score rate is (%)	15.90±14.32	12.42±10.38	1.781	162	0.077
Service score rate is (%)	9.21±4.56	6.76±4.38	3.51l	162	0.001
Defensive reach percentage (%)	53.77±19.28	41.75±19.78	3.939	162	0.000
Effective pass rate is (%)	57.57±25.44	50.83±24.63	1.723	162	0.087
Receiving rate of (%)	64.42±24.57	58.56±24.63	1.524	162	0.129
Number of opponent errors (N)	16.51±4.03	12.67±4.07	6.075	162	0.000

Table 7 Comparison of various technical and tactical indicators of different competition results (4 games)

results / Technical and tactical indicators	Win 3:1 (N=35) The mean ± standard deviation	Negative 1:3 (N=35) The mean ± standard deviation	T checkout		
			t	df	Sig.
The spike score rate is (%)	45.51±9.77	38.76±8.64	3.070	69	0.003
The block score rate is (%)	21.52±12.24	15.85±11.12	2.039	69	0.045
Service score rate is (%)	8.31±3.18	8.16±4.78	0.157	69	0.876
Defensive reach percentage (%)	48.75±24.18	46.20±25.06	0.436	69	0.664
Effective pass rate is (%)	52.65±27.66	51.25±30.40	0.204	69	0.839
Receiving rate of (%)	65.27±24.80	62.37±28.42	0.459	69	0.648
Number of opponent errors (N)	21.19±4.14	19.03±4.67	2.066	69	0.043

Table 8 Comparison of various technical and tactical indicators of different match results (5 games)

results / Technical and tactical indicators	Win 3:2 (N=31) The mean ± standard deviation	Negative 2:3 (N=31) The mean ± standard deviation	T checkout		
			t	df	Sig.
The spike score rate is (%)	47.32±6.27	43.79±6.98	2.096	60	0.040
The block score rate is (%)	16.44±12.84	17.99±15.08	-.436	60	0.664
Service score rate is (%)	7.47±2.87	6.85±3.00	0.833	60	0.408
Defensive reach percentage (%)	54.93±21.90	50.96±23.67	0.686	60	0.495
Effective pass rate is (%)	59.84±25.65	56.21±26.59	0.546	60	0.587
Receiving rate of (%)	74.65±21.86	68.80±21.77	1.057	60	0.295
Number of opponent errors (N)	21.48±6.29	21.23±6.62	0.157	60	0.875

In volleyball matches, a technical comparison between the winning team and the losing team shows that when they win 3-0, the winning team is significantly better than the losing team in terms of spike, serve, proper defense, and the number of opponent errors ($P<0.01$); When winning 3-1 or 3-2, the winning team has a higher dunk, block rate, and opponent error rate ($P<0.05$ or $P<0.01$); When the score is only 3-2, the winning team has a significantly higher scoring rate ($P<0.05$). The percentage of dunks scored is crucial.

4. Conclusion

This study focuses on the 2018-2019 women's volleyball league and finds that upstream teams have significant advantages in spike, block, and offensive support. Under different results, the winning team performs better in spike, serve, and defense. Reasonable tactical layout is crucial for improving scoring efficiency and game results.

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